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July 2, 2003  
RC-03-0135

Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
LICENSEE EVENT REPORT (LER 2003-002-00)  
REACTOR TRIP DUE TO MAIN GENERATOR BREAKER UNEXPECTEDLY  
OPENING

Attached is Licensee Event Report (LER) No. 2003-002-00, for the Virgil C. Summer Nuclear Station (VCSNS). The report describes an event in which the VCSNS reactor tripped due to degraded contacts on the main generator field breaker position sensing circuit causing the digital voltage regulator to sense a loss of excitation and unexpectedly opening the main generator breaker. This LER is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

Should you have any questions, please call Mr. Ronald B. Clary at (803) 345-4757.

Very truly yours,

Stephen A. Byrne

JT/SAB/dr  
Attachment

c: N. O. Lorick  
N. S. Cams  
T. G. Eppink (w/o attachment)  
R. J. White  
L. A. Reyes  
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NRC Resident Inspector  
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NSRC  
RTS (0-C-03-1614)  
File (818.07)  
DMS (RC-03-0135)

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to [bj1@nrc.gov](mailto:bj1@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503.

## 1. FACILITY NAME

Virgil C. Summer Nuclear Station

## 2. DOCKET NUMBER

05000395

## 3. PAGE

1 OF 4

## 4. TITLE

Reactor Trip Due To Main Generator Breaker Unexpectedly Opening

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	12	2003	2003	002	00	07	02	2003	FACILITY NAME	DOCKET NUMBER
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			20.2201(b)			20.2203(a)(3)(II)			50.73(a)(2)(II)(B)	50.73(a)(2)(IX)(A)
10. POWER LEVEL			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(III)	50.73(a)(2)(X)
100			20.2203(a)(1)			50.36(c)(1)(I)(A)		X	50.73(a)(2)(IV)(A)	73.71(a)(4)
			20.2203(a)(2)(I)			50.36(c)(1)(II)(A)			50.73(a)(2)(V)(A)	73.71(a)(5)
			20.2203(a)(2)(II)			50.36(c)(2)			50.73(a)(2)(V)(B)	
			20.2203(a)(2)(III)			50.46(a)(3)(II)			50.73(a)(2)(V)(C)	
			20.2203(a)(2)(IV)			50.73(a)(2)(I)(A)			50.73(a)(2)(V)(D)	
			20.2203(a)(2)(V)			50.73(a)(2)(I)(B)			50.73(a)(2)(VII)	
			20.2203(a)(2)(VI)			50.73(a)(2)(I)(C)			50.73(a)(2)(VIII)(A)	
			20.2203(a)(3)(I)			50.73(a)(2)(II)(A)			50.73(a)(2)(VIII)(B)	
OTHER Specify in Abstract below or in NRC Form 366A										

## 12. LICENSEE CONTACT FOR THIS LER

## NAME

R. B. Clary, Mgr., Nuclear Licensing

## TELEPHONE NUMBER (Include Area Code)

(803) 345-4757

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	EL	41	G080	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete EXPECTED SUBMISSION DATE). X NO

## 15. EXPECTED SUBMISSION DATE

MONTH DAY YEAR

## 16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

A reactor trip on Over Temperature Delta Temperature (OTDT) occurred from 100 percent power on May 12, 2003, at 0102 hours, due to the main generator breaker opening. A root cause team was assembled to investigate the cause of the trip. Troubleshooting identified that the main generator field breaker position sensing circuit had degraded contacts that caused the digital voltage regulator to sense a loss of excitation and open the main generator breaker. Immediate corrective action involved replacing degraded contacts, removing suspect breaker position switch contacts, and adding a redundant circuit for this voltage regulator anticipatory trip function.

This was a programmed anticipatory trip function. The main generator never actually lost excitation until the trip and was fully protected.

Notification of this event was reported under Event Notification EN# 39838 at 0328 hours on May 12, 2003 in accordance with 10 CFR 50.72(b)(1).

Following the plant trip, all major systems functioned as expected. The plant was stabilized in Mode 3.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

**PLANT IDENTIFICATION**

Westinghouse - Pressurized Water Reactor

**EQUIPMENT IDENTIFICATION**

Main Generator Field Breaker

**IDENTIFICATION OF EVENT**

A reactor trip on Over Temperature Delta Temperature (OTDT) occurred from 100 percent power on May 12, 2003, at 0102 hours due to the main generator breaker opening.

**EVENT DATE**

05/12/03

**REPORT DATE**

07/02/03

**CONDITIONS PRIOR TO EVENT**

Mode 1, 100% Power

**DESCRIPTION OF EVENT**

On May 12, 2003, with the plant operating at 100% power, alarms for Regulator 1 and 3 were received for the Main Generator Voltage Regulator, followed shortly by a Regulator 2 alarm. The main generator breaker opened causing a turbine trip, which in turn, caused the reactor to trip. The first-out annunciator indicated that a reactor trip on Over Temperature Delta Temperature (OTDT) had occurred, at 0102 hours due to the main generator breaker opening at 100 percent power.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

**DESCRIPTION OF EVENT (Cont'd)**

Following the plant trip, all major systems functioned as expected. The plant was stabilized in Mode 3.

Condition Event Report C-03-1614 was generated to address the event to perform a root cause evaluation to understand why the event happened and to develop effective corrective actions.

**CAUSE OF EVENT**

The cause of this event is attributed to vibration induced wear on the main generator field breaker movable and stationary secondary disconnect contacts, and degradation of the field breaker cell switch mechanism that resulted in intermittent high resistance connections and a false field breaker open signal to the digital voltage regulator.

**ANALYSIS OF EVENT**

On May 12, 2003, the reactor tripped on Over Temperature Delta Temperature (OTDT) due to the main generator breaker opening at 100% power.

The trip was caused by a loss of field breaker position signal, which can be attributed to a continuity problem in the series circuit; including the breaker auxiliary switch (41MAS) contacts, the breaker cell switch (41MPS) contacts, and the breaker secondary disconnect contacts. The main generator field breaker is mounted on the breaker enclosure in the sidewall of the Alterrex Exciter enclosure, which is adjacent to the main generator. This enclosure is mounted on a common foundation pedestal with the main turbine and main generator, and as such, is subject to continuous vibration from the unit operation. Inspection of the cell switch and secondary disconnect contacts showed wear and fretting as a result of being subjected to this continuous vibration. As these contacts degraded, an intermittent high resistance condition developed (125VDC circuit). This intermittent high resistance condition was sensed by the EX2000 voltage regulator as a loss of excitation due to an open generator field breaker, when the breaker was in fact, closed. As a result, the EX2000 transferred to its backup voltage regulator.

Due to the intermittent nature of the degraded connection, the backup regulator now sensed that the main generator field breaker was still closed. However, about 65 seconds later, the degraded connection again falsely indicated that the main generator field breaker was open and the protection system opened the main generator breaker on potential loss of excitation. This was a programmed anticipatory trip function. The main generator never actually lost excitation until the trip and was fully protected.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

**CORRECTIVE ACTIONS**

The Station is taking the following corrective actions:

- New movable and stationary secondary disconnect contacts were installed in the main generator field breaker. The auxiliary switch contacts were inspected and cleaned.
- A modification was implemented to add a redundant set of field breaker auxiliary contacts in parallel with the original contacts to reduce the vulnerability to this failure mode. The cell switch contacts for the anticipatory trip circuit were bypassed to preclude a false trip signal.
- The main generator field breaker maintenance procedure is being revised to require replacement of the movable and stationary contacts during each refueling outage (previously the contacts were inspected and replaced on an as needed basis).

**PRIOR OCCURRENCES**

None